Book review

"Modern Supramolecular Gold Chemistry", edited Antonio Laguna

It gives me great pleasure to review and discuss the newly published book 'Modern Supramolecular Gold Chemistry: Gold-Metal Interactions and Applications'. The Editor is Prof. Antonio Laguna from the Universidad de Zaragoza in Spain and is himself an authoritive figure in the area of synthetic and solid state gold chemistry. Along the same theme, all of the authors contributing to the nine chapters belong to the Materials Science Institute of Aragon or its Associated Unit at the University of Zaragoza or the University of La Rioja. These authors have extensive experience and expertise in gold technology and it indicates the strength and depth that resides in Spain.

The book gives a general overview with extensive referencing up to around 2007 of three themes centred on supramolecular gold chemistry. These are the synthesis and properties of supramolecular arrays formed via gold-gold, gold-heterometal or other secondary bond such as hydrogen, then synthesis of nanomaterials including small atomic clusters and then onto applied aspects involving sensor, LED, luminescent, liquid crystal and catalysis applications. The common link to all of the chapters is of course the tendency for gold and its ions to form interactions with itself and other metals.

Chapter one prepares the reader with a general treatment on gold chemistry, and highlights theoretical considerations such as relativistic effects, key oxidation states and coordination compounds. In chapter two gold-gold interactions are reviewed, namely containing gold (I)-gold (I) closed shells and their resulting structural arrays beginning with binuclear species through to multi-nuclear clusters. I found the schematics of the structures under review simplified but clear and easy to follow and added to the flow of the chapters. The next chapter focused on gold-gold bonds and synthetic, structural aspects of synthesising nanoparticles and also low nuclearity clusters. Emphasis on the nature of the stabilising ligand or organic moiety was the key theme in this chapter resulting in size and shape selectivity. The reader is given an overview of current literature for cluster, nanoparticle synthesis and the latter sections highlight anchoring nanoparticles to various substrates via linkers and then current applications for such particles.

Chapters four and five discuss gold heterometal interactions and supramolecular architecture by secondary interactions. Again the chapters are well designed in format with numbers for each section logical and well referenced. Of note here were the now changing structural representations and contrasting formats seen, mostly due to directly using them from the original texts. However, this did not distract from the clarity of the discussions.

The last four chapters look at optical and catalytic effects starting with chapter six focusing in on Luminescence of Supramolecular gold arrays. The introduction familiarises the reader with the history and electronic transitions required for luminescence and then moves to discuss properties for binuclear through to polynuclear arrays and where appropriate any solution studies, again keeping with the methodical treatment with respect to nuclearity as seen in earlier chapters. Chapter seven discusses liquid crystal synthesis and properties and is really about utilizing the polynuclear chemistry already established in the earlier chapters and this is clearly related and gives relevance to be included in this book. The last two chapters deal with homogeneous and heterogeneous catalysis respectively. One could argue they are out of place within the general theme of the book. I would argue differently in that these are still early days in the area of gold catalysis and I believe key advances will be made by having synthetic chemists revealing new structural entities and catalysis researchers using that molecular information to aid in discovering new catalysis whether it be size/shape selectivity for nanoparticles or molecular arrays in solution for gaining insight homogeneous transformations. So, for me, these chapters sit comfortably.

In summary, I highly recommend this book to researchers engaged in gold chemistry and technology as a primary reference book and also as a book to ponder over and, maybe, use as a source of inspiration to do some gold chemistry. This book will also be suited to post-graduate students embarking on gold-based PhDs to achieve a rounded view on supramolecular gold chemistry and applications/ properties arising from these materials.

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